Fast Faraday Cup

C. Deibele

Feb. 11, 2003

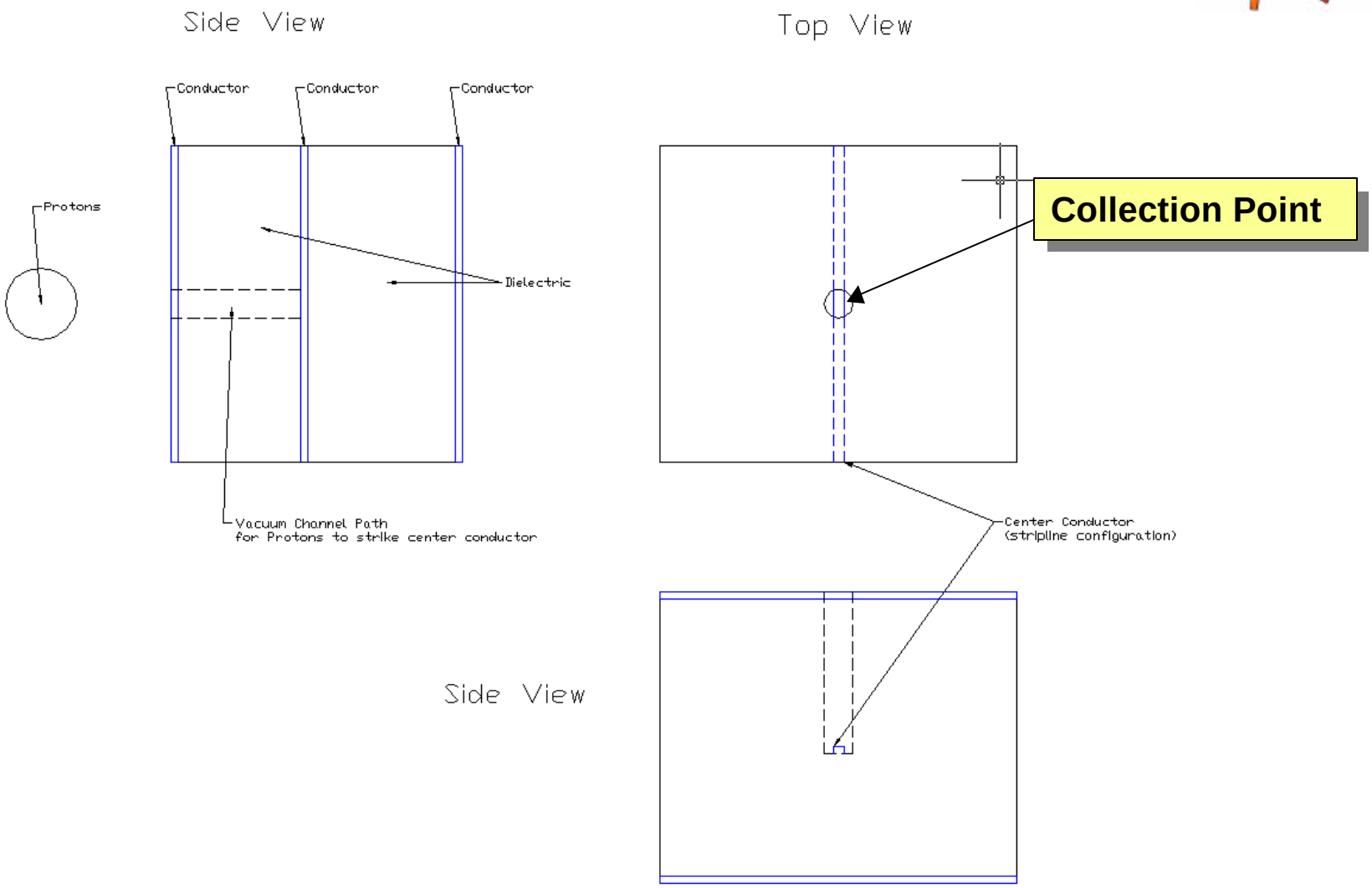
Fast Faraday Cup Outline

- ***Background***
- ***Schematic***
- ***Measurements***
- ***Improvements***

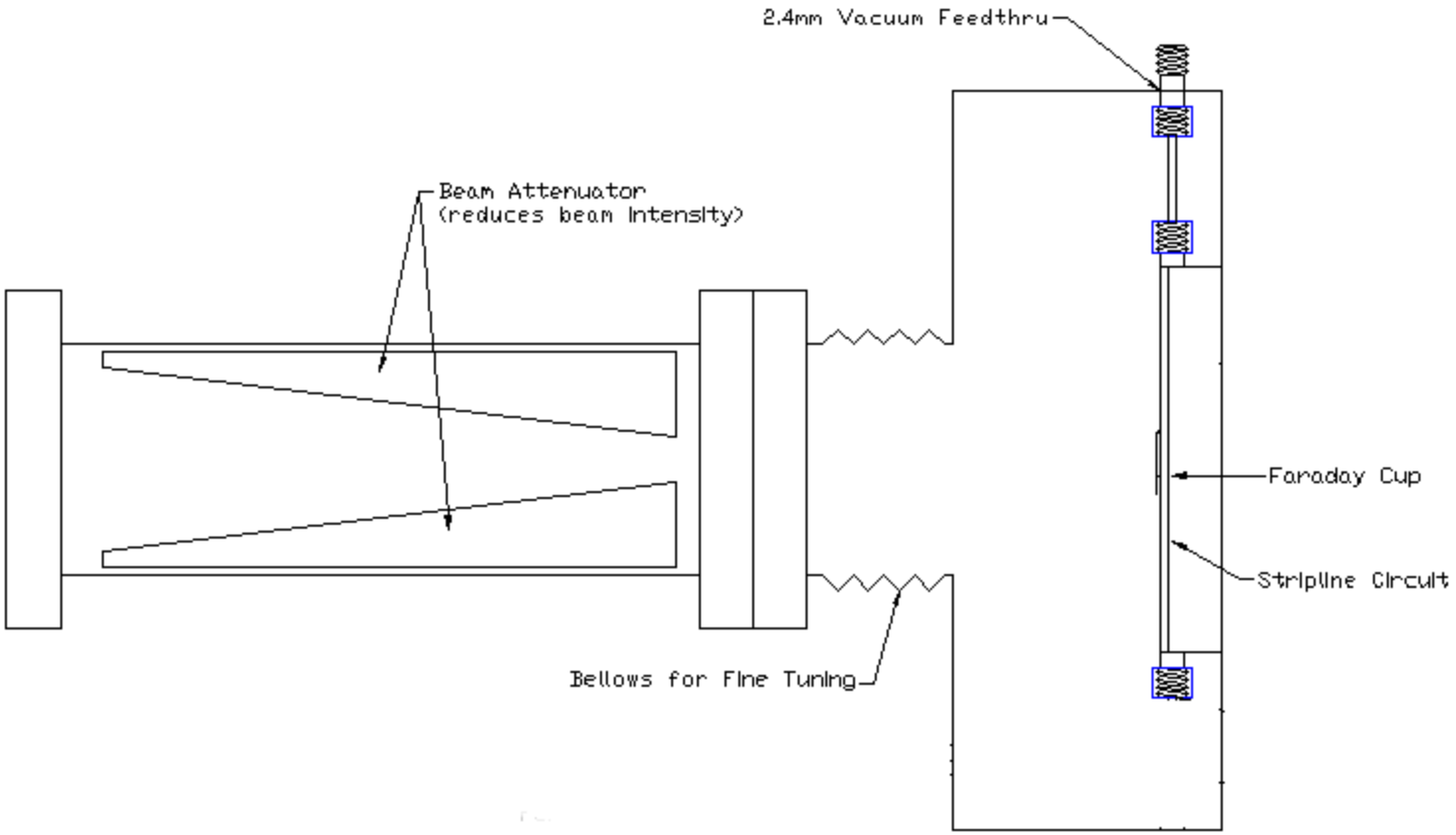
Fast Faraday Cup

Definition – Faraday Cup with enough bandwidth such that the microbunch structure is observable.

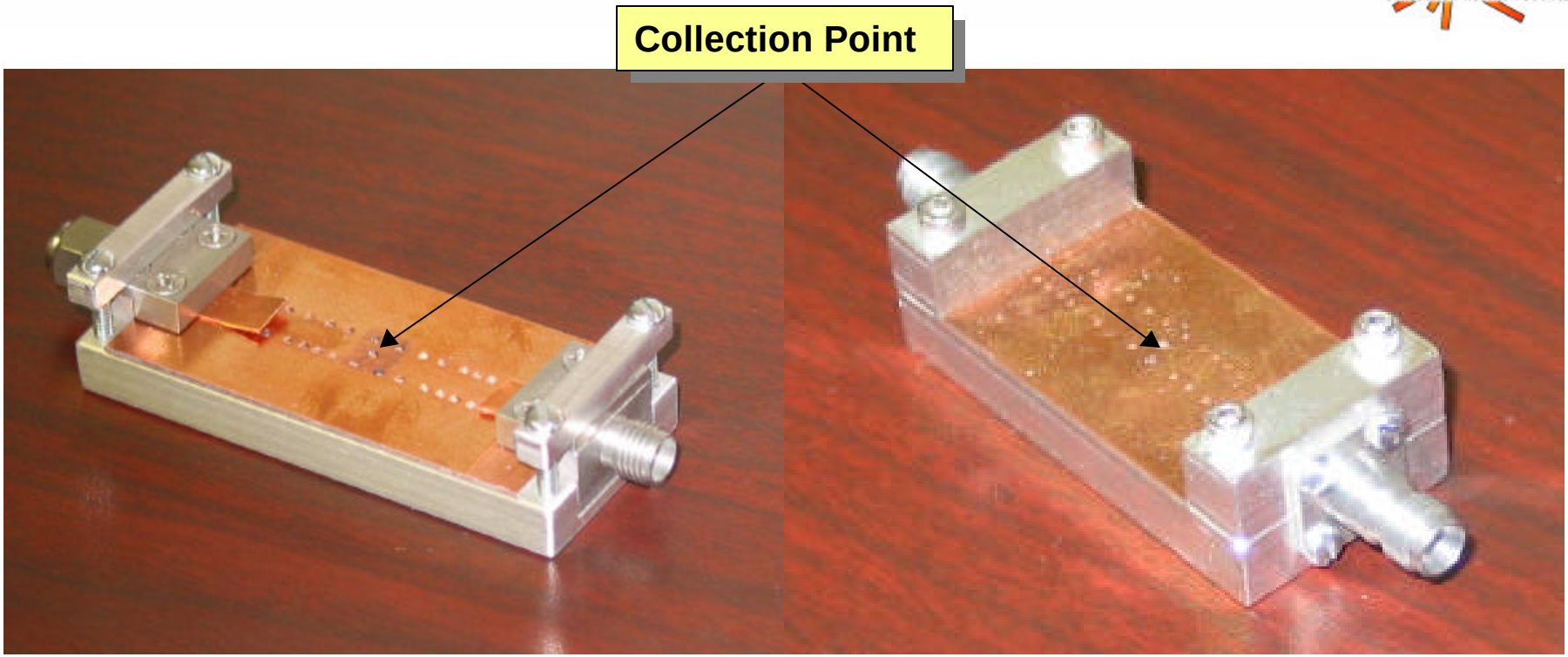
Fast Faraday Cup Schematic



Fast Faraday Cup Overview Schematic

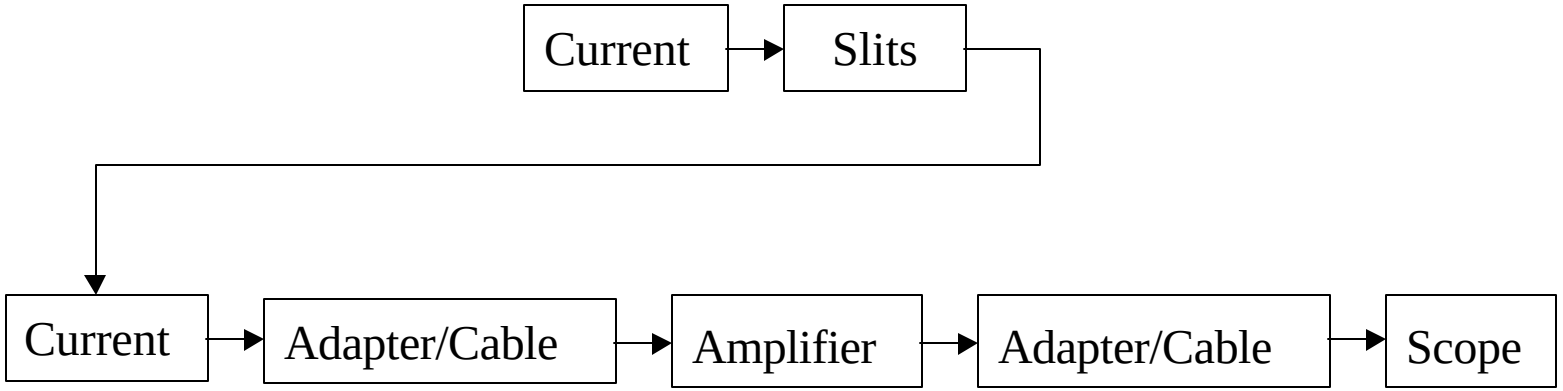


Fast Faraday Cup

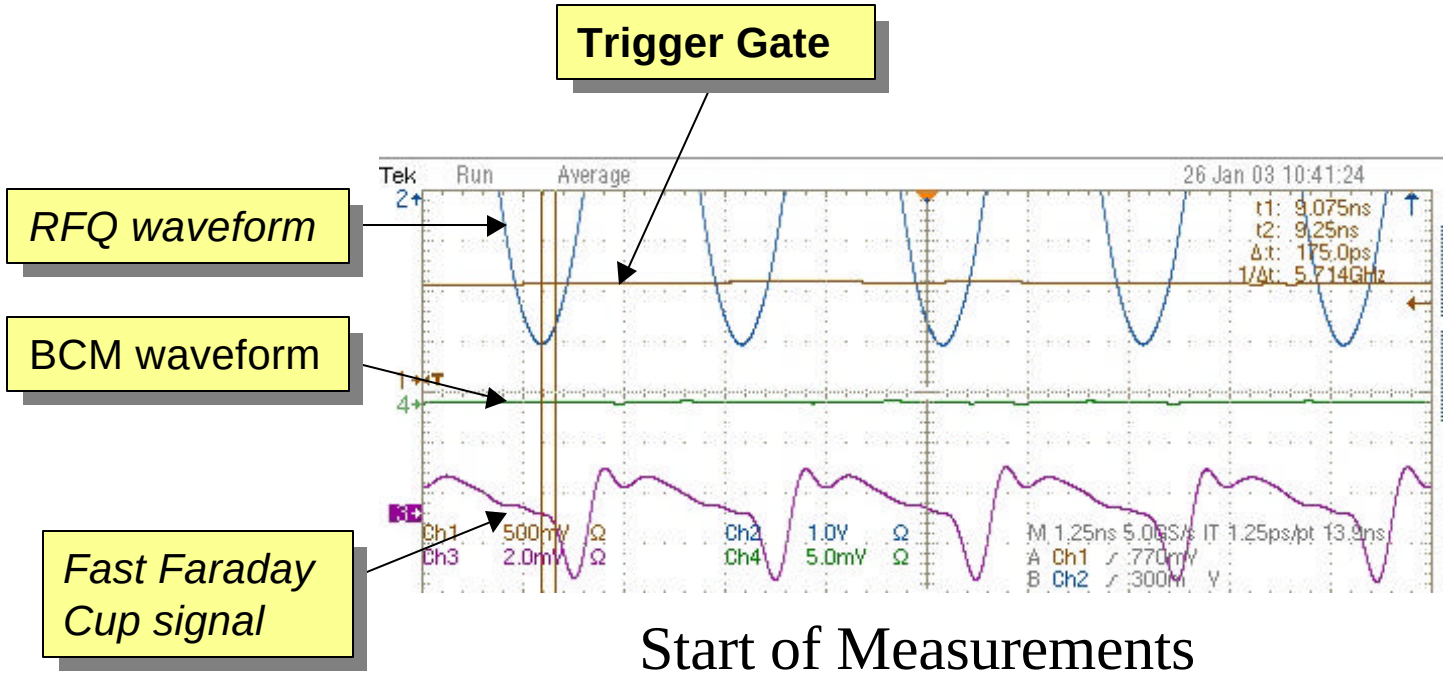


- Fast Cup Designed, Built, and Tested at ORNL – Measurements done at INFN (Carbon beam) and at ORNL (H- beam)
- Beam box with actuators and collimation slits provided by INFN
- Simulations and bench tests demonstrate that it should reliably measure features of the beam to less than 10 psec -- S/N issues

Fast Faraday Cup Schematic

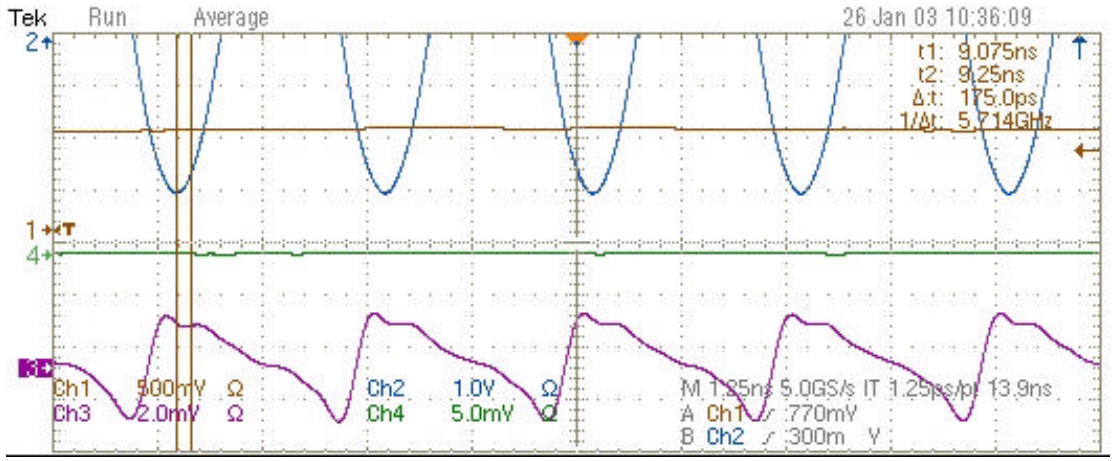


Fast Faraday Cup Measurement - ORNL



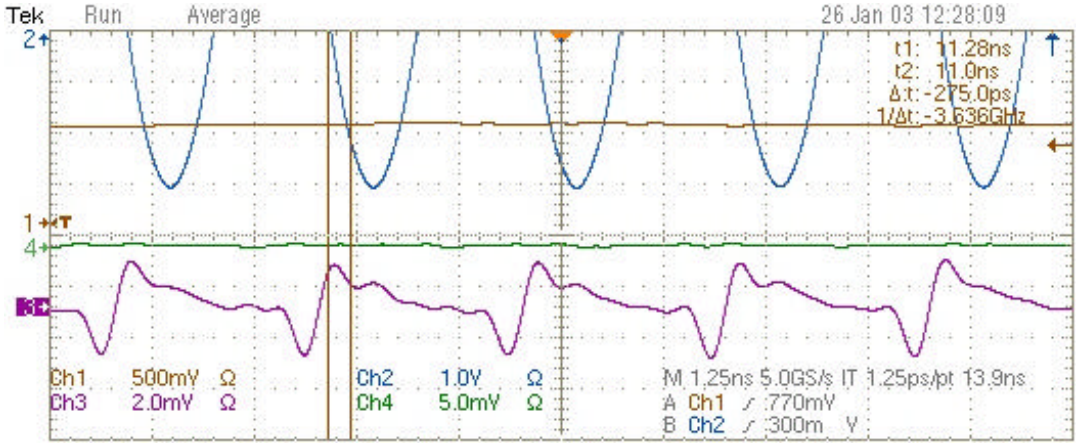
Start of Measurements

Fast Faraday Cup Measurement Validation



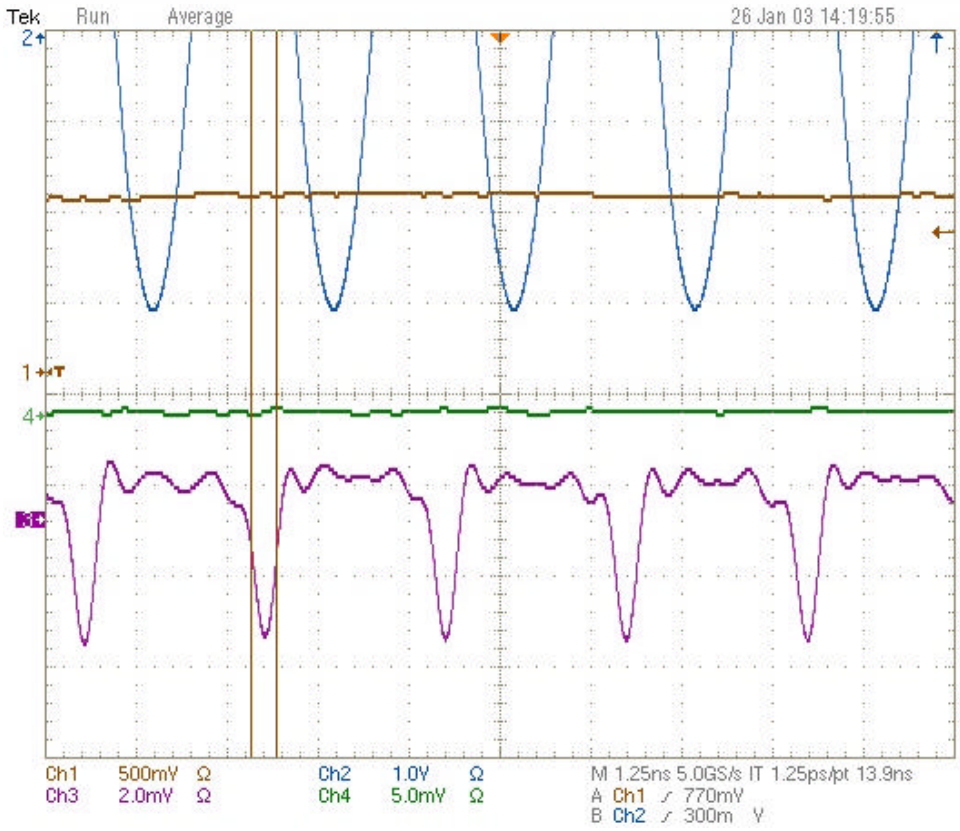
Rebuncher #4 is turned off

Fast Faraday Cup after Rebuncher Re-phase



After re-phasing Rebuncher cavities

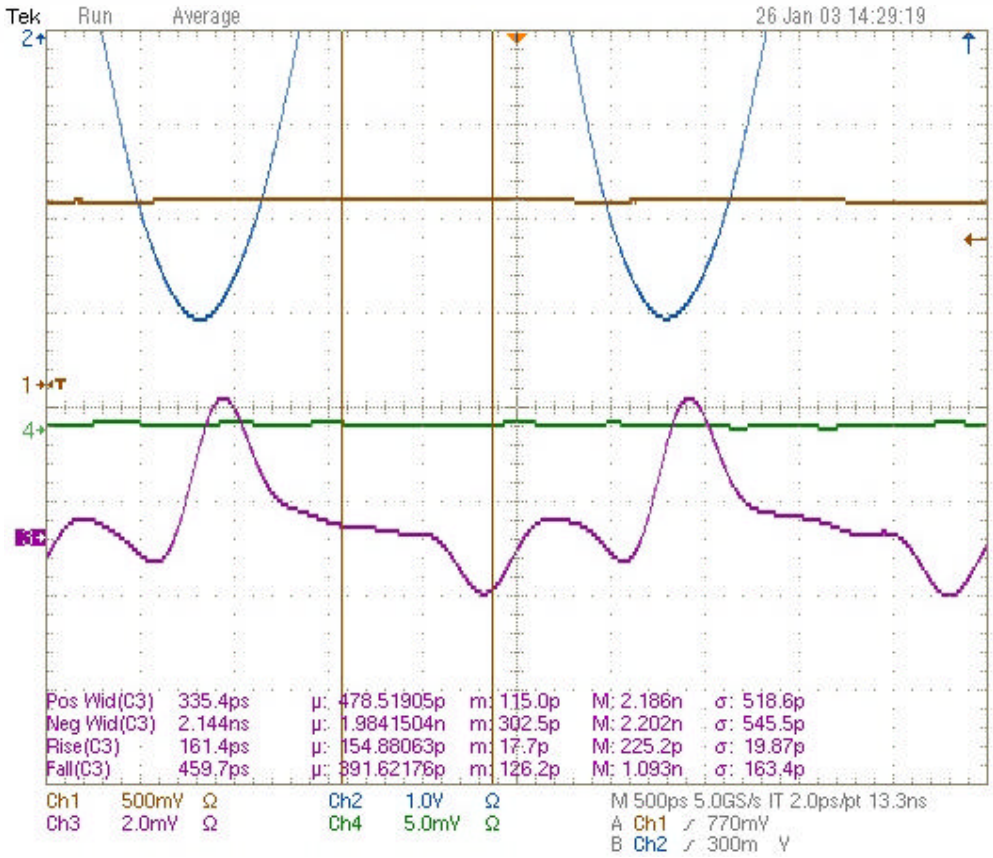
Fast Faraday Cup – Best Profile



Best Current Profile We Could Achieve*

** S. Henderson, E. Tanke, M. Poggi, C. Deibele*

Fast Faraday Cup – check



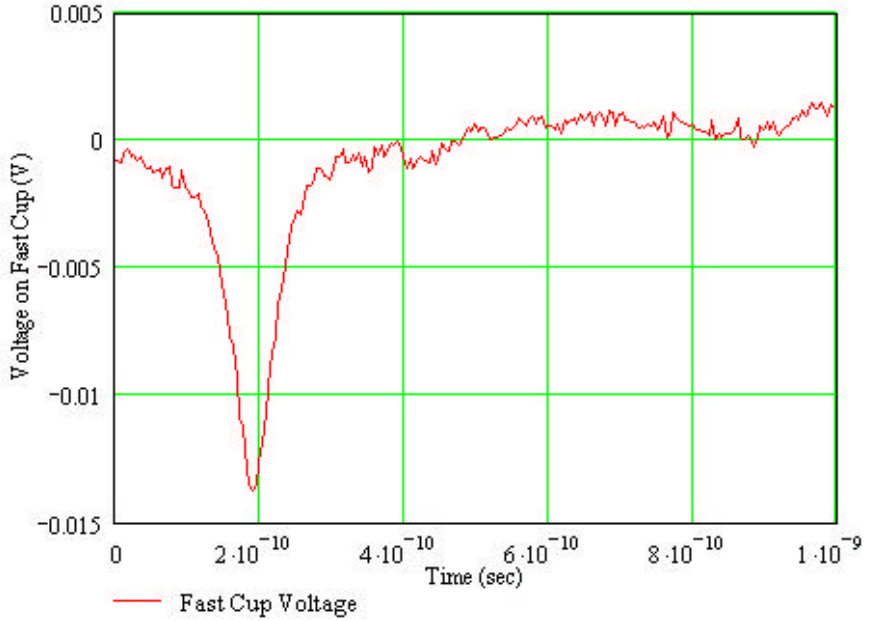
Rebuncher #4 detuned by 180 deg

Fast Faraday Cup – High Bandwidth Msmt.

Fast Faraday Cup

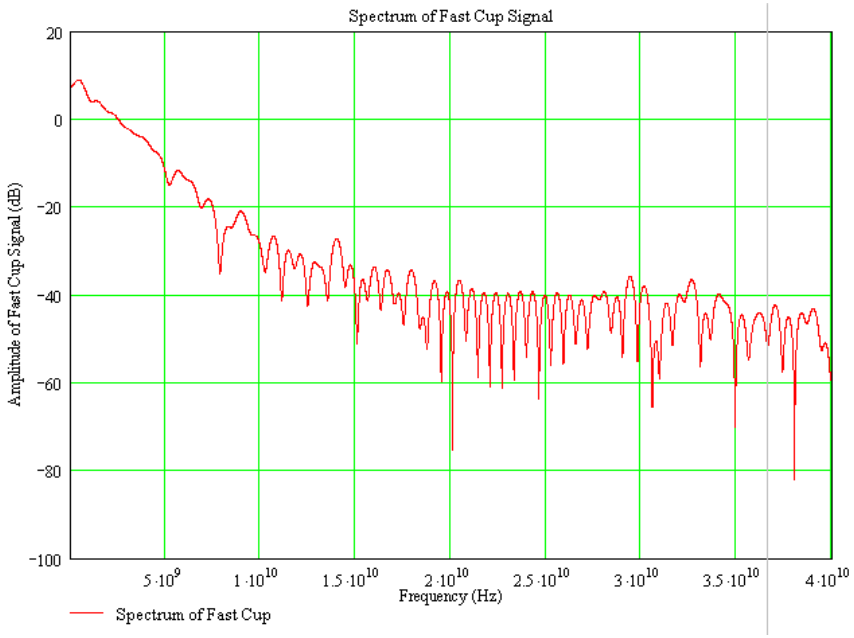
High Bandwidth Measurement

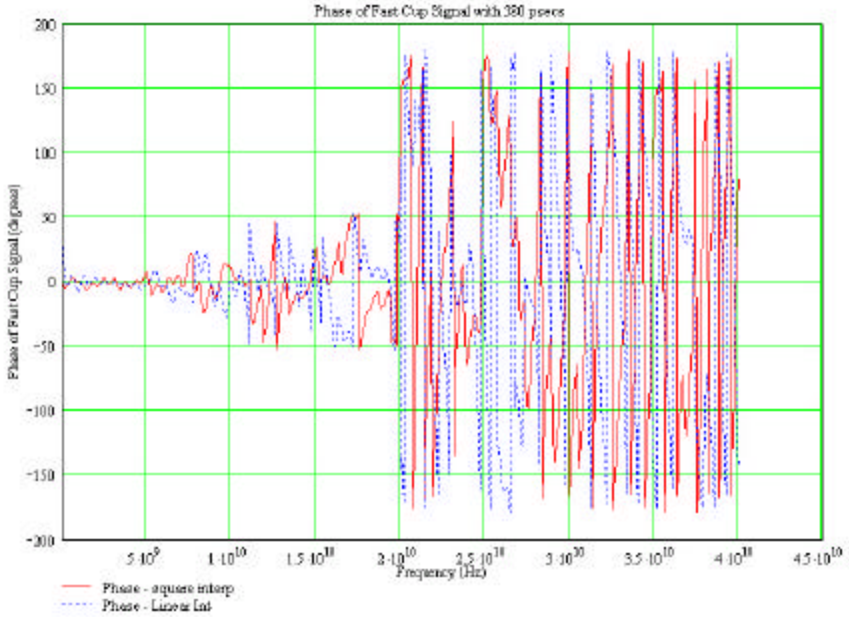
FWHM=142 psec



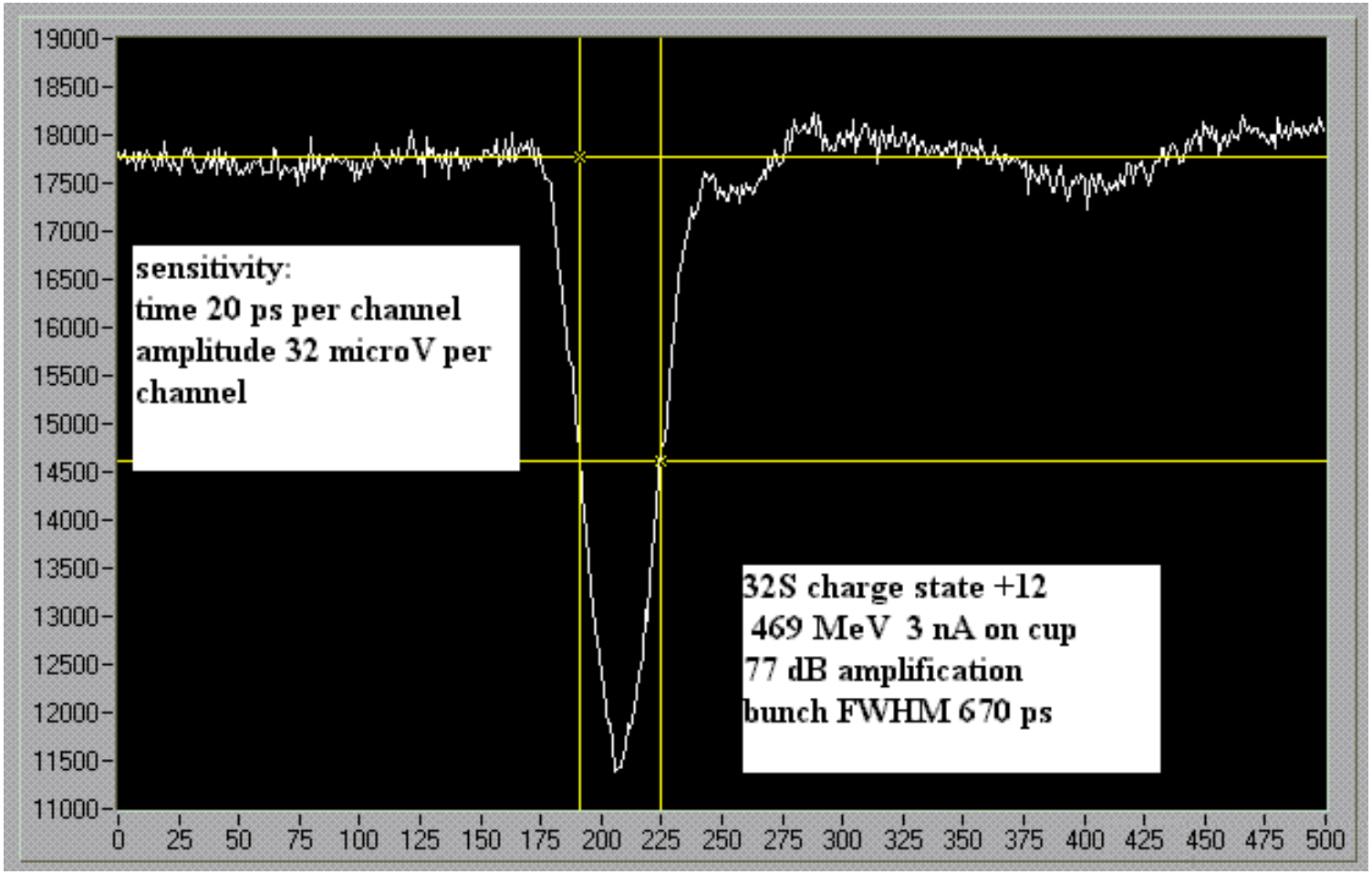
Spectrum of Fast Faraday Cup Signal

- S/N looks good to ~ 15 GHz – phase suggests ~ 20 GHz
- More can certainly be demonstrated with shorter bunches

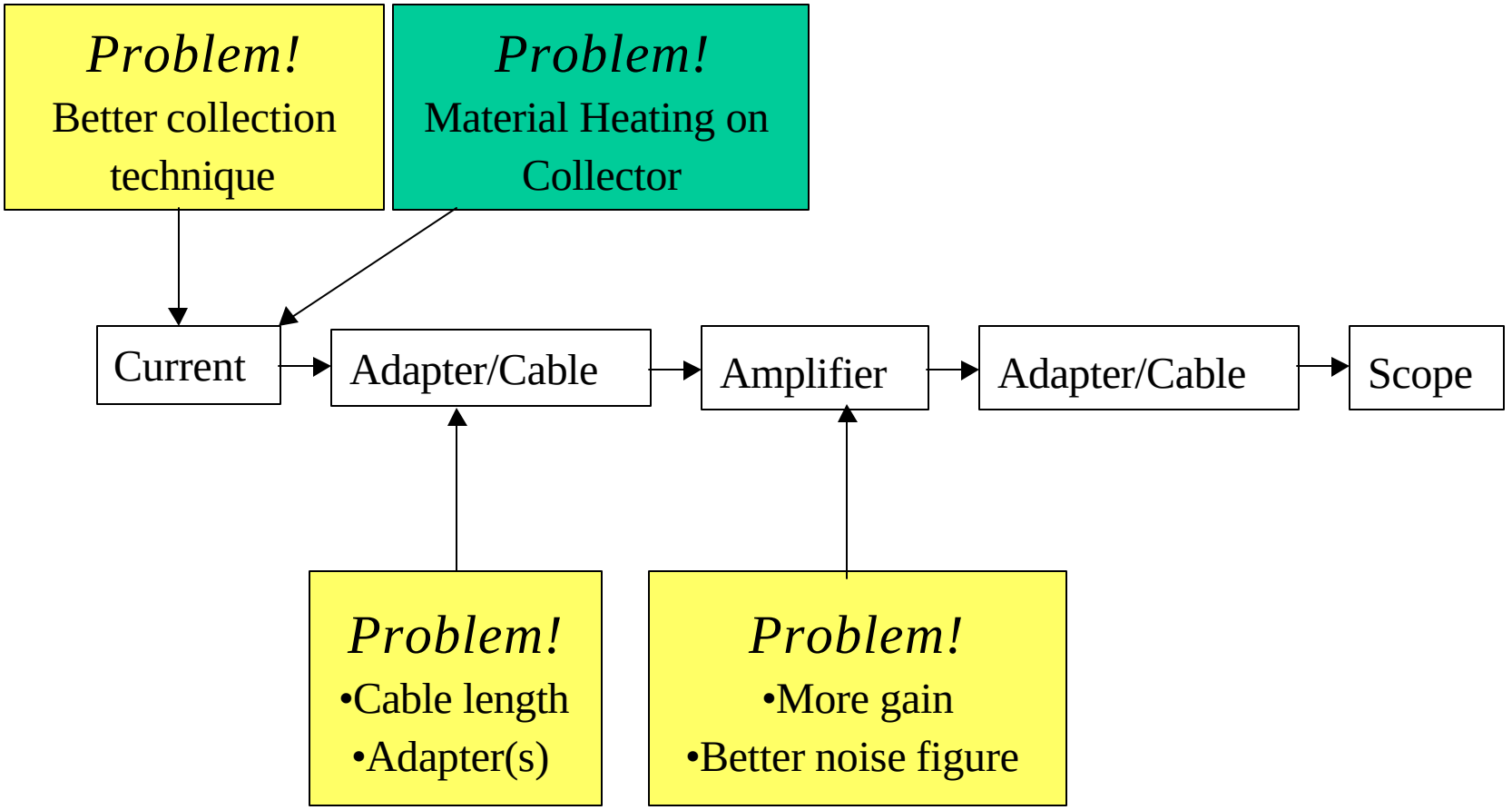




Fast Faraday Cup Measurement - INFN



Fast Faraday Cup Problem Identification



Fast Faraday Cup Gratitude

Props to Everyone!

- *INFN – Livio, Marco*
- *ORNL Vacuum (Randy, Rob)*
- *ORNL Mechanical (Tom, Paul,Graeme)*
- *ORNL Physics (Sang Ho, Stovall, Sasha, Stuart, Dong-O, Eugene)*
- *ORNL RF - equipment*
- *ORNL Controls – (Eric)*
- *ORNL Diagnostics – (Saeed, Andy, Jim)*
- *ORNL Management/OPS*
- *LBNL – (Staples, Oshatz)*